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DE 019725916 A DE 019725915 A
DE 019522937 A US 5657233 A

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(71) Applicant(s)
LuK Lamellen und Kupplungsbau Beteiligungs KG
(Incorporated in the Federal Republic of Germany)
Industriestrasse 3, D-77815 Buhl,
Federal Republic of Germany

(72) Inventor(s)
Diana Katharine Bowker

(74) Agent and/or Address for Service
Anthony Cundy & Co
1 Olton Bridge, 245 Warwick Road, SOLIHULL,
West Midlands, B92 9AH, United Kingdom

(54) Abstract Title
Diagnostic device

(57) The invention relates to a diagnostic device, especially for a power transmission element for a motor vehicle that comprises an engine, a transmission and a clutch.

GB 2 364 577 A

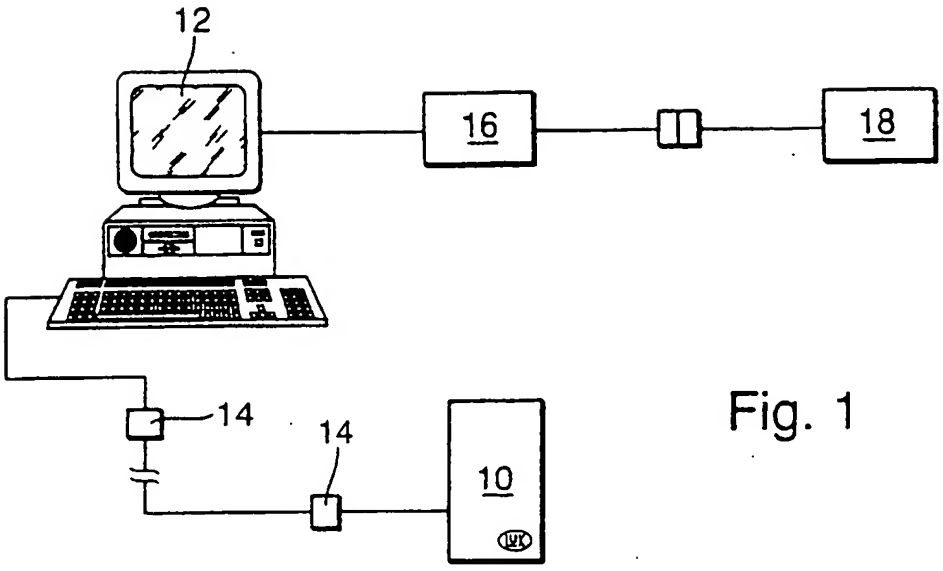

Fig. 1

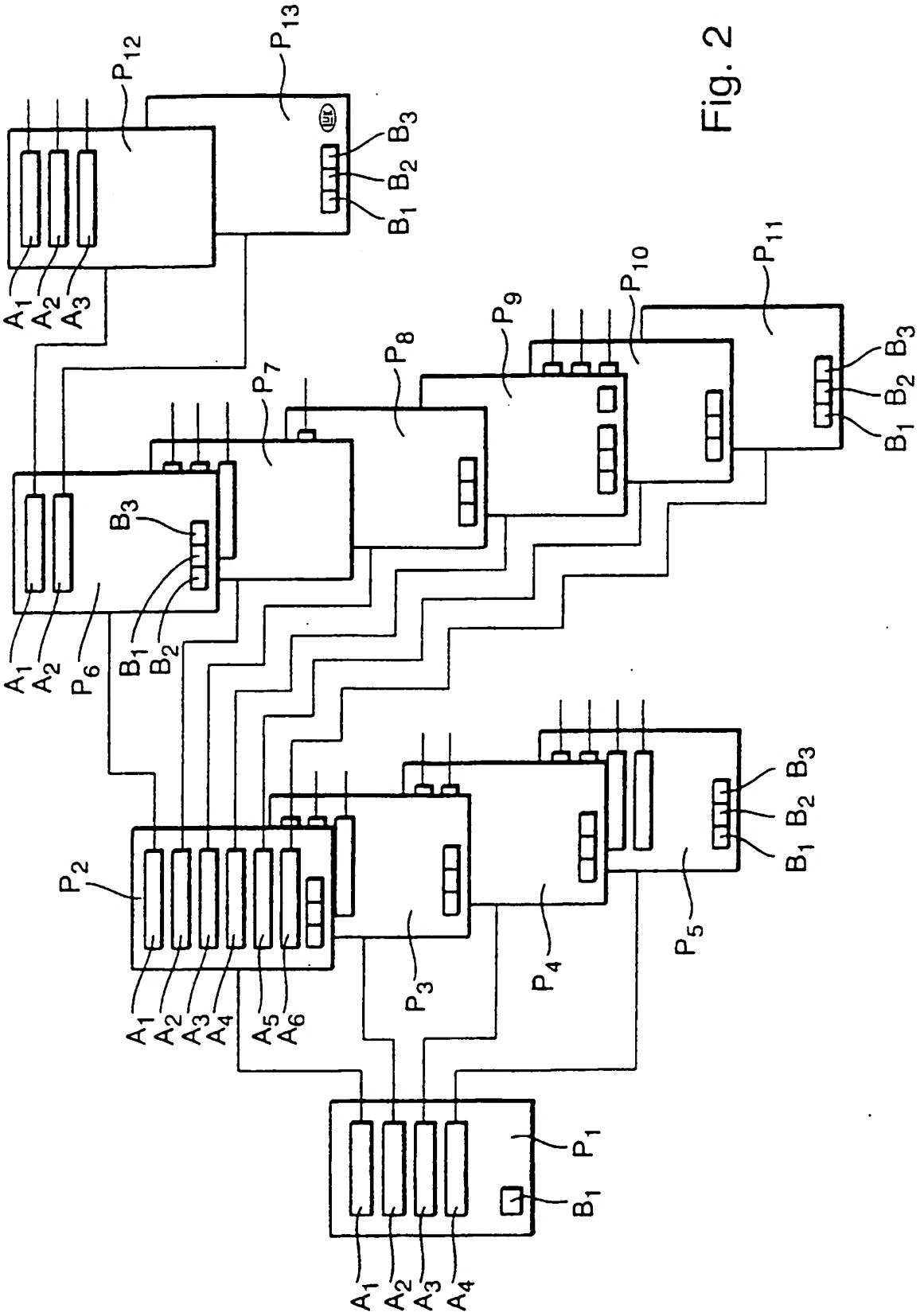
P12
P13
B1 B2 B3
A1 A2 A3
P7
P8
P9
P10
P11
B3
B1 B2
A1 A2 P6
P2
A1 A2 A3 A4 A5 A6
P3
P4
P5
B1 B2 B3
P1
B1
A1 A2 A3 A4

Fig. 2

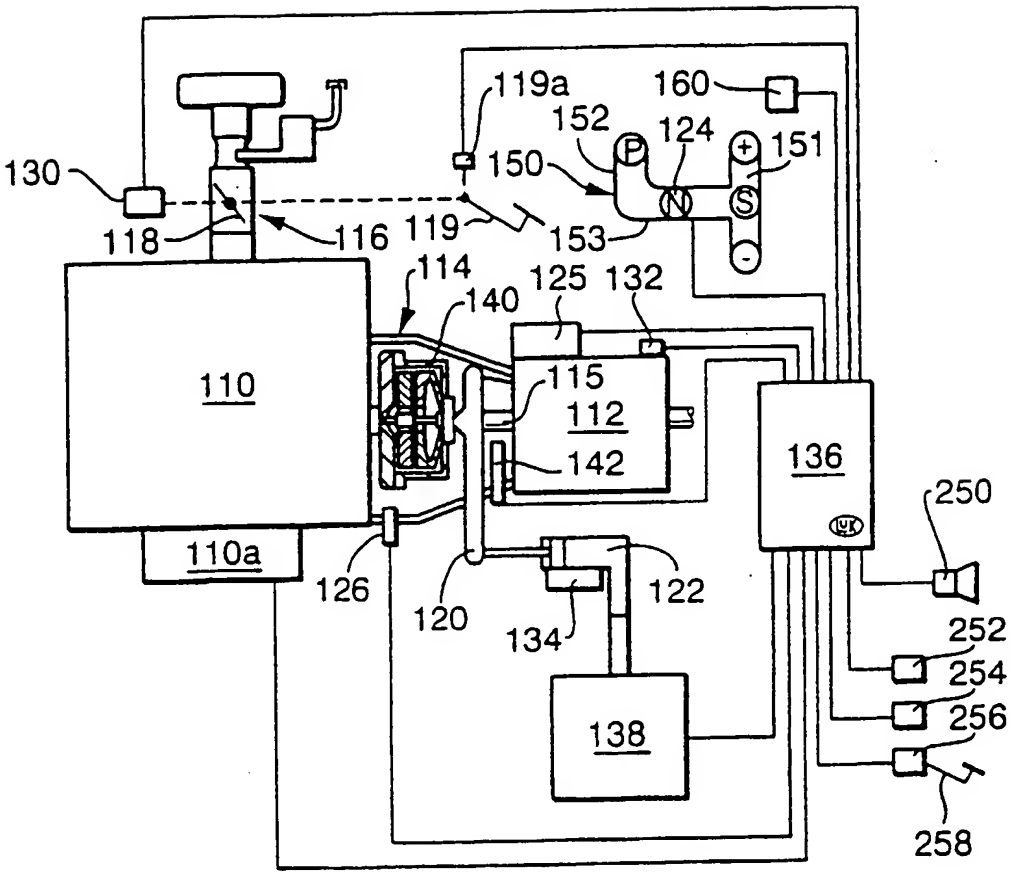
130
118
116
119
119a
150
152
153
160
124
151
P
N
S
+
-
114
140
125
132
110
115
112
142
136
110a
126
120
134
122
138
250
252
254
256
258

Fig. 3

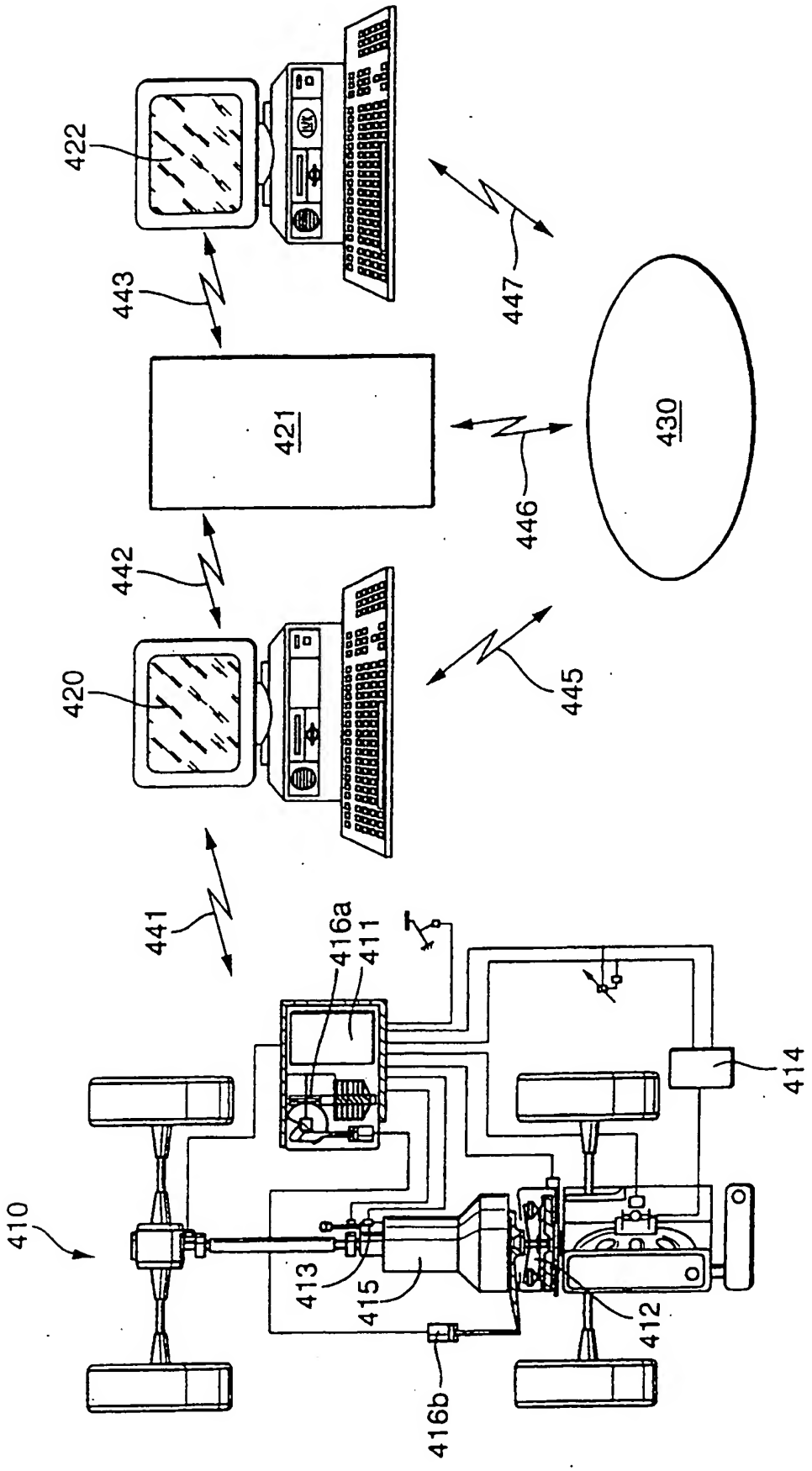
422
443
421
447
430
446
442
420
445
441
416a
411
414
410
413
415
412
416b

Fig. 4

Diagnostic system

The invention described herein relates to diagnostic systems and in particular diagnostic systems for motor vehicles.

In accordance with one aspect of the present invention a microprocessor based diagnostic system comprises a series of electronic pages such as electronic data files, each page defining a series of active areas, each active area being representative of a diagnostic topic; each active area is interlinked with another page relating to the diagnostic topic associated with the said area, whereby, by selection of appropriate diagnostic topics an operator can be taken step by step through a diagnostic routine.

The diagnostic topics represented by the active areas may relate to the system that is being diagnosed, symptoms of faults occurring in a particular system, or tests to be carried out in diagnosing a fault in a system. For example, an operator of the diagnostic system can read data out of a memory of a computer and, on the basis of the said data, can for example initiate a procedure for learning and memorising various vehicle parameters, such that the computer determines or receives various sensor data from various vehicle sensors and stores them in a memory as necessary.

The computer with memory for storing the data may be a vehicle-based computer unit or an external computer.

The diagnostic device of the invention described here may operate on a fixed-position computer or accessed remotely therefrom, for example via a computer network such as the Internet. Means may also be provided for direct connection of the diagnostic system to a system under test, by virtue of which information, for example fault codes or data relating to tests performed as part of the diagnostic routine, may be input directly into the diagnostic system.

According to a further inventive concept, a diagnostic system based on a microprocessor is described, in particular one for a system on vehicles comprising a control unit, the said diagnostic system comprising a number of sections such as electronic pages or page sections characterised by a hierarchic structure, such that each page or page section defines a number of active areas that form a level of the hierarchy and each active area represents a diagnostic topic; each active area is interlinked with another page of lower hierarchic level relating to the diagnostic topic associated with the said area, whereby, by selection of the appropriate pages or page sections, an operator can be led step by step through a diagnostic routine.

In this advantageous example embodiment of the invention, the information content of pages or page sections at lower hierarchic levels concerns only a smaller area, such that the information content of pages or page sections becomes more detailed, the lower is their hierarchic level.

The structure can therefore be subdivided for example like a tree, in accordance with topic areas under headings.

In an advantageous embodiment of the invention active areas are present on the pages or page sections, which form a link to pages or page sections of the same hierarchic level. Likewise, active areas are present which form a link with pages or page sections of a higher hierarchic level.

In this way the said tree structure can advantageously be branched not only downwards, but also parallel and/or upwards. Irregular branching may also be carried out by virtue of the said inventive concept.

A further feature of the example embodiment of the invention is that the diagnostic system is advantageously associated with a central computer, such as a Server, which can be accessed from a decentralised computer, such as a Client.

Advantageously, the diagnostic device has an active content which can be transferred to the decentralised computer and implemented there.

Accessing takes place appropriately via a computer network, and for this it is particularly advantageous to use the Internet, in particular using a protocol such as http and client software such as Webbrowser.

In other example embodiments the use of other computer networks and/or other protocols may have advantages.

It is very advantageous for the diagnostic system, as in the present example embodiment, to have access to data in a data-bank such as a support data-bank, and for these data to be displayable on the pages or page sections. In particular, active areas are formed on pages or page sections, which form links to contents of the data-bank.

Furthermore, it is very appropriate in this example embodiment to provide an interface for direct connection of the control unit of the system being diagnosed to the decentralised computer. In this way, the diagnostic system can access data from the control unit of the system being diagnosed, directly or via an intermediate storage medium.

In particular, it is advantageous, on the basis of the data from the control unit, to be able to display particular pages or page sections, and for example data from a support data-bank.

On the basis of data from the control unit, particular interactions with the control unit can be implemented; for example, updated and/or improved software can be downloaded into the control unit or a defect in the existing software can be removed.

In the present example embodiment of the invention it is also very advantageous if a further computer can communicate with the decentralised computer, so that the control unit of the system to be diagnosed can also be accessed via the said further computer to allow certain

interactions to be implemented. Access of the further computer to the data-bank is also advantageously enabled.

An embodiment of the invention is described below as an example, with reference to the accompanying drawing, which shows:

Fig. 1: Schematic diagram of a diagnostic system in accordance with the invention described herein

Fig. 2: Typical diagnostic routine in accordance with the invention described

Fig. 3: Schematic representation of a motor vehicle

Fig. 4: Schematic diagram of another preferred example embodiment of the invention for diagnosis of a motor vehicle

As illustrated in Fig. 1, the diagnostic routine of the diagnostic system takes place on a network computer 10 connected via an interface such as a modem 14 and the Internet to a remote computer 12. The remote computer 12 has an interface 16 via which the computer 12 can be connected to the control unit, such as the computer unit 18, of a motor vehicle. The control unit 18 can for example control an automatic force transmission device of a vehicle, such as an automatic clutch or an automatic transmission. The vehicle's control unit comprises a computer unit with a memory store.

As illustrated by Fig. 2, the diagnostic system has a series of electronic files such as electronic HTML pages P_1 to P_N, such that each page has a number of active areas A_1 to A_N. Hypertext link words are provided between the active areas A_1 to A_N of one page P_1 to P_N and subsequent pages P_2 to P_N.

The active areas A_1 to A_N of each page P_1 to P_N represent different diagnostic topics. For example, in a diagnostic system for diagnosing faults in an automatic force transmission

system of a motor vehicle, P_1 may be divided into areas A_1 to A_4 which represent sub-systems of the force transmission system. For example:

A_1 may represent a clutch actuation device
A_2 a gear selection device of a transmission
A_3 a hydraulic power supply device, and
A_4 an electronic control unit.

Each of the active areas A_1 to A_4 on page P_1 is linked to further pages P_2 to P_5 respectively, each of these pages P_2 to P_5 having active areas A_1 to A_4 which are linked to still further pages. For example, page P_2 can have six active areas A_1 to A_6 and the areas A_1 to A_6 of page P_2 can be linked to further pages, respectively P_6 to P_{11}. Similarly, the pages P_6 to P_{11} have active areas which are again linked with still other pages.

For example, the areas A_1 to A_6 may represent various fault symptoms, which relate to the clutch actuation device. As an example:

A_1 the clutch disengages unexpectedly during driving in gear
A_2 the clutch does not always engage during driving when a gear is selected
A_3 the clutch remains engaged and causes the engine to stall
A_4 the clutch is often hard to disengage for a gear shift
A_5 the clutch reacts unexpectedly when starting from rest
A_6 the engine will not start.

Pages P_6 to P_{11} may then give further information as to possible causes of the symptom selected on page P_2, giving for example further symptoms to look for and tests to carry out which may be represented by further active areas A_1 to A_N.

Each of the pages P_2 to P_N may include further active areas or 'buttons' B_1 to B_N which provide additional links with other pages in the system. For example pages P_2 to P_N may have 'buttons' B_1 to B_3, such that:

B_1 provides a direct link with a fault code page, which lists all fault codes that may be generated by the control unit of the device and that provide a link with individual pages in turn relating to each undivided fault code,

B_2 provides a direct link with the main menu page P_1, and

B_3 provides a direct link with a test procedure relating to a specific fault symptom on the page in question.

Moreover the pages, in particular page P_1, may include a button B_4 which provides a direct link with the diagnostic system of the control unit in order to provide a direct read-out of any fault codes generated by the diagnostic system of the control unit, to read out the current settings of the control unit, etc.

Active areas or buttons may also be provided on selected pages to provide links to data files relating to the system and/or vehicle under test and by virtue of which information relating to the vehicle/device may be accessed, for example:

vehicle manufacturer;
vehicle model and characteristic features;
specific system features available;
original clutch clamped position at calibration;
number of clutch actuations performed during vehicle driving time;
maximum permitted clutch speed;
assumed idling speed;
physical parameters of the clutch;
gear ratios;
differential ratio;
clutch dropout speed;
fault history.

By selection of appropriate active areas A_1 to A_N on successive pages P_1 to P_N the operator is taken step by step, by means of instructions he should carry out, through a diagnostic routine until a fault is identified.

At each stage in the diagnostic routine direct input from the control unit 18 controlling the system under investigation may be used to select an appropriate area A_1 to A_N. For example, if areas A_1 to A_3 of page P_2 represent fault codes, the fault codes may be read directly from the control unit 18, to make an appropriate selection on page P_2. Furthermore, where tests are carried out, the resulting operating parameters may be read directly from the control unit 18, to initiate further stages of the diagnostic routine.

Where the operator is unable to correct a fault, the system may also provide a direct link via the Internet with a central diagnostic centre from which further assistance may be obtained.

Various modifications may be made without going beyond the scope of the present invention. For example, in the embodiment described, it is assumed that the sub-system at fault can be identified. If this is not the case, then the entry page of the diagnostic system should have active areas relating, for example, to fault symptoms. It may consequently be advantageous to provide a front page with a menu of different entry pages to the system.

Whereas the present invention has been described with reference to an automatic force transmission system of a motor vehicle, it is applicable to other systems of motor vehicles or to fault diagnostic systems in general.

While in the above system data are read in directly from the control unit 18 of the system under investigation, such information may also be input manually or read out from previously specified files.

Fig. 3 shows an engine 110 with a starter and its associated starter circuit 110a, connected via a friction clutch 114 and a transmission input shaft 115 to a gearbox 112 with several sychronised gear ratios. Fuel is fed to the engine via a throttle-valve assembly 116,

comprising for example a throttle valve 118 actuated and controlled by the accelerator pedal 119 or by an electric motor. The invention can be used equally well with petrol engines and Diesel engines with electronic or mechanical fuel injection.

The clutch 114 is actuated via a release fork 120, which is in turn acted upon by the adjustment element of the main drive coupling in the form of a hydraulic slave cylinder 122.

A gear selection lever 124 such as a gear-lever is moved in a gate 150, which has two arms 151 and 152 connected to one another by a guide 153 from the end of the arm 152 to half-way between the ends of the arm 151. The gate 150 provides five positions: R at the end of the arm 152; N mid-way between the ends of the guide 153; S at the junction between the arm 151 and the guide 153; and + and – at the outer ends of the arm 151. Within the arm 151 the lever 124 is spring-loaded to the central position S. Position N of the gear-lever 124 corresponds to the neutral position; position R corresponds to the position for reversing and position S to that for driving forwards; moving the lever briefly to position + delivers a command signal which changes gear up by one ratio, and moving the lever 124 briefly to position – delivers a command signal which changes gear down by one ratio.

The positions of the lever 124 are monitored by a series of sensors, for example microswitches or optical sensors, which are arranged around the gate 150. Signals are transmitted from these sensors to a control unit 136 with a computer. An output signal from the control unit 136 controls a gear-change mechanism 125 by virtue of which the transmission gear ratios are changed to match the movement of the gear-lever 124 by the driver. The gear-change mechanism may for example comprise hydraulic cylinders and electromagnetically actuated control valves that move sensor elements, to change between the various gear ratios as for example disclosed in the earlier patent application WO 97/05410, whose content is expressly included in the disclosure content of the present patent application. The control unit 136 also controls the actuator mechanism 138 that actuates the clutch 140.

Besides the signals from the gear-lever 124, the control unit 136 also receives signals from:

sensor 1219a, which indicates the extent to which the accelerator pedal 119 has been actuated;
sensor 130, which indicates how far open the throttle valve 118 is;
sensor 126, which indicates the engine speed;
sensor 142, which indicates the clutch disc rotation speed;
sensor 134, which indicates the position of the clutch slave cylinder, and
sensor 132, which indicates which gear is engaged.

The control unit 136 evaluates the signals from these sensors, in order to control the actuation of the clutch 114 when starting from rest and when changing gear, as described for example in the earlier patent applications or patent specifications EP0038113, EP0043660, EP0059035, EP0101220 and WO 92/13208, whose contents are expressly included in the disclosure content of the present patent application.

Besides the aforesaid sensors, the control unit 136 also receives signals from a door contact switch 252, from the ignition switch 1254 and from the brake switch 256 belonging to the main brake assembly, for example the footbrake 258 of the vehicle.

To the control unit 136 is connected a warning device 250, such as an alarm buzzer, to draw the driver's attention to the occurrence of particular operating conditions or to warn him of them in advance. In addition to the alarm buzzer 250, or instead of it, a blinking warning light or some other warning or display device may be used. A gear position indicator 160 is also provided, which shows which gear is engaged.

During the vehicle's operation faults of the system may occur, which are recorded in a memory of the computer unit so that they can be called up again at a later time.

By means of a diagnostic process or a starting routine, a learning process in which the current sensor values are recorded in a memory can also take place. In this connection

reference should be made to WO 95/21073, whose content is expressly included in the disclosure content of the present patent application.

Fig. 4 is a schematic representation of a further preferred example embodiment of the invention for the diagnosis of a motor vehicle 140. In this example embodiment the systems diagnosed are ones in motor vehicle comprising a control unit, in particular an actuation unit 413 for a transmission 415, which may be a gear-shift system or a continuous transmission, and/or an actuation device of a torque transmission mechanism 412, such as a clutch, formed by sub-units 416a and 416b.

For diagnostic purposes the control unit 411 of the devices in question, which may be formed as a single assembly or else in separate portions, and if necessary other control units as well, such as an engine control unit 414 or control units (not shown here) for the control of other systems, is/are linked to a computer 420 for data exchange.

The link between the control unit 411, if necessary 414 and/or others, and the computer 420 may be effected via an electric and/or optical cable connection, or without wiring by means of a radio or infra-red link.

The computer 420 is a decentralised (e.g. Client) computer, for example a mobile computer such as a laptop or hand-held mini-computer, linked via a connection 442 to another, central computer 421 as Server.

In the present example embodiment the link 442 is a remote link, in particular more remote than the distance between the computer 420 and the vehicle 410, effected via a computer network such as the Internet and advantageously then using a protocol such as http. In other example embodiment it may also be advantageous to use a local network such as a LAN to establish the link 442.

In the example embodiment described, a further (Client) decentralised computer 422 is also linked to the central computer 421. The link 443 between them may be realised similarly to the link 442.

In the present example embodiment the inventive concept also comprises a data-bank 430, which is advantageously a support data-bank. The data-bank 430 is linked to the computers 420, 421 and/or 422, so that each or at least one of these computers 420, 421 and 422 can access the data-bank 430.

A microprocessor-based diagnostic system is located essentially on the central computer 421. It comprises a series of sections such as electronic pages or page sections. Preferably, the sections are formed as electronic pages, which are formulated for example in a mark-up language such as html, each page being saved in a separate file. It may also be appropriate, however, to formulate the sections as page sections and store them in files of their own.

Taken together, the sections are arranged in a hierarchic – for example tree-like – structure, such that a series of active areas are defined on each page or each section. Links are provided to other sections, preferably to a section lower in the hierarchy with a narrower but more detailed information content, although if necessary links can also be provided to sections at the same and/or at higher hierarchic levels.

The information in the sections relates to diagnostic topics relevant to the system or device to be diagnosed, so that an operator, by selecting appropriate pages or page sections, can be led step by step through a diagnostic routine. Examples of a diagnosis and contents of the sections are shown in Fig. 2 and the description pertaining thereto.

The operator operates the diagnostic system via the central computer 420 using client software such as Webbrowser, the diagnostic system advantageously having active contents that can be transferred from the central computer 421 to the decentralised computer 420 and implemented there, for example to effect actions or interactions; the active contents may for example be Java or Active-X elements.

Diagnosis is effected with the help of diagnostic data from the control units of systems of the motor vehicle 410. For example, these diagnostic data may be or may contain fault codes. The diagnostic data can be read out directly or displayed, and may come from an intermediate memory.

Further, the present invention includes the use of a data-bank, such as a support data-bank, in which numerous data are stored which contribute towards solving the problems that affect the systems or devices to be diagnosed.

On the basis of particular diagnostic data, sections of the diagnostic system can be called up or data can be retrieved from the data-bank and, for example, displayed. On the basis of particular diagnostic data, the diagnosed system can also be manipulated, for example by means of the aforesaid active contents of the diagnosis device. In the example embodiment described, updated software can be downloaded into a control unit or a fault can be removed in some other way.

If, for example, it proves impossible either by means of the diagnostic device or via the data-bank to achieve a satisfactory diagnosis or remove a fault, according to the invention a further decentralised computer 422 can be operated by a particular user who can also access the data-bank and who has special abilities, in particular additional ones compared with the user of the computer 420, for effecting a diagnosis and removing faults, for example thanks to additional software and/or more advanced knowledge.

With the present diagnostic system and in particular by virtue of the design options and preparation of the information in accordance with the chosen presentation format, pictorial and perhaps even language-independent, symptom-orientated diagnostic and corrective means are provided for problems that affect motor vehicle systems which comprise a control unit.

By incorporating the diagnostic system and/or the data-bank 430 in a central computer 421, maintenance of the system by the operator is made very simple.

If it is intended that the diagnostic system should be usable from various other, decentralised computers, it may be advantageous to protect access to the diagnostic system and/or the data-bank by means of a password, and so to enable every user to access specific information and functions.

All the other patent applications cited in the present patent application are also explicitly included in the disclosure content of the present application.

The claims attached to the application are formulation proposals without prejudice to the achievement of additional patent protection. The applicant reserves the right to make additional claims relating to combinations hitherto disclosed only in the description and/or the figures.

Back-references in the subordinate claims relate to a further development of the object of the principal claim, by virtue of the features specified in the respective subordinate claim; they are not to be understood as renouncing the achievement of independent, objective protection of the combination of features in the subordinate claim referred back to.

Since, in relation to the state of the prior art on the priority date, the objects of the subordinate claims can constitute independent inventions in their own right, the applicant reserves the right to treat them as objects of independent claims or distinguishing explanations. They may also contain independent inventions whose design is independent of any of the objects of the preceding subordinate claims.

The example embodiments are not to be taken as limitations of the invention. Rather, within the scope of the present disclosure numerous variations and modifications are possible, in particular such variants, elements and combinations and/or materials which, for example by combination with or deviation from individual features and elements or process

steps related to those described in the general description, embodiments and claims, and contained in the drawings, could be adopted by a person with knowledge of the field with a view to achieving the objectives and which, by virtue of combinable features, lead to a new object or to new process steps or process step sequences, including any that relate to manufacturing, testing and working methods.

CLAIMS

1. Microprocessor-based diagnostic system, in particular for motor vehicles, comprising a series of electronic pages such as files, each page defining a series of active areas and each active area being representative of a diagnostic topic; each active area being interlinked with another page relating to the diagnostic topic associated with the said area, whereby, by selection of appropriate diagnostic topics, an operator can be taken step-by-step through a diagnostic routine.

2. Diagnostic system according to Claim 1,
characterised in that
the diagnostic system is accessed remotely, from a centralised computer.

3. Diagnostic system according to Claim 2,
characterised in that
the diagnostic system is accessed via a computer network.

4. Diagnostic system according to Claims 2 or 3,
characterised in that
the diagnostic system is accessed via the Internet.

5. Diagnostic system according to any of the preceding claims,
characterised in that
an interface is provided for direct connection to the control unit of the system under test.

6. Diagnostic system according to any of the preceding claims,
characterised in that
active areas are provided for direct connection of pages to common pages of the system.

7. Diagnostic system according to any one of the preceding claims,
characterised in that
active areas are provided to give direct links which enable data to be read out from a diagnostic system associated with the control unit of the system under test.

8. Microprocessor-based diagnostic system, in particular for systems in motor vehicles comprising a control unit, comprising a series of sections such as electronic pages or page sections arranged in a hierarchical structure, such that a series of active areas are defined in each page or page section, the said areas forming a level of the hierarchy, and each active area represents a diagnostic topic; each active area is linked to another page on a lower hierarchical level, which relates to the diagnostic topic associated with the said area, whereby, by selection of appropriate pages or page sections, an operator can be led step by step through a diagnostic routine.

9. Diagnostic system in particular according to Claim 8,
characterised in that
the information content of the pages or page sections relates to a narrower area, the lower is the hierarchic level.

10. Diagnostic system in particular according to Claims 8 and/or 9,
characterised in that
the lower the hierarchical level, the more detailed is the information content of the pages or page sections.

11. Diagnostic system in particular according to Claim 8,
characterised in that
active regions form a link to pages or page sections on the same hierarchical level.

12. Diagnostic system in particular according to Claim 8,
characterised in that
active regions form a link to pages or page sections on a higher hierarchical level.

13. Diagnostic system in particular according to one or more of the preceding claims,
characterised in that
the diagnostic system is essentially incorporated in a central computer, such as a Server, which a decentralised computer can access as Client.

14. Diagnostic system in particular according to Claim 13,
characterised in that
the diagnostic system has active contents which can be transferred to the decentralised computer and implemented there.

15. Diagnostic system in particular according to Claim 13,
characterised in that
the diagnostic system can be accessed via a computer network.

16. Diagnostic system in particular according to Claim 15,
characterised in that
the diagnostic system can be accessed via the Internet.

17. Diagnostic system in particular according to Claim 16,
characterised in that
the diagnostic system can be accessed via client software, such as Webbrowser.

18. Diagnostic system in particular according to one or more of the preceding claims,
characterised in that
the diagnostic system accesses data from a data-bank, such as a support data-bank, and these data can be displayed on the pages or page sections.

19. Diagnostic system in particular according to Claim 18,
characterised in that
active areas on the pages or page section form links to contents of the data-bank.

20. Diagnostic system in particular according to one or more of the preceding claims,
characterised in that
an interface is provided for direct connection of the control unit of the system to be diagnosed, to the decentralised computer.

21. Diagnostic system in particular according to Claim 20,
characterised in that
via the interface, the diagnostic system accesses data from the control unit of the system to be diagnosed, directly or via an intermediate storage medium.

22. Diagnostic system in particular according to Claim 21,
characterised in that
on the basis of the data from the control unit, particular pages or page sections are displayed.

23. Diagnostic system in particular according to Claim 21,
characterised in that
on the basis of the data from the control unit, particular interactions with the control unit are carried out.

24. Diagnostic system in particular according to Claim 23,
characterised in that
on the basis of data from the control unit, updated and/or improved software is downloaded into the control unit, or a fault in the existing software is removed.

25. Diagnostic system in particular according to one or more of the preceding claims,
characterised in that
communication with the decentralised computer can be established via a further computer.

26. Diagnostic system in particular according to one or more of the preceding claims, **characterised in that**
the said further computer can access the control unit of the system to be diagnosed, and particular interactions can be implemented.

27. Diagnostic system in particular according to one or more of the preceding claims, **characterised in that**
the said further computer can access the data-bank.

28. Diagnostic system, provided essentially as described herein, with reference to and as illustrated in Figs. 1 to 4 in the attached drawings.

INTERNATIONAL SEARCH REPORT

Inten al Application No
PCT/DE 00/01596

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 G01M17/007 G01M13/02 G01M17/00 G05B23/02

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 G01M G05B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	DE 197 25 915 A (DAIMLER BENZ AG) 28 January 1999 (1999-01-28) the whole document	1-28
Y	DE 197 25 916 A (DAIMLER BENZ AG) 28 January 1999 (1999-01-28) the whole document	1-28
A	US 5 657 233 A (CHERRINGTON AARON F ET AL) 12 August 1997 (1997-08-12) the whole document	1-28

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

° Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

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Date of the actual completion of the international search	Date of mailing of the international search report
11 January 2001	29/01/2001

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax (+31-70) 340-3016	Zafiropoulos, N

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INTERNATIONAL SEARCH REPORT

Inter ...al Application No
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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

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